

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (Currently Amended): A method of treating a subterranean formation, comprising the steps of:

continuously injecting a fluid into the subterranean formation; and
periodically applying a pressure pulse having a given amplitude and frequency to the fluid while the fluid is being injected into the subterranean formation; wherein the step of applying the pressure pulse is performed at about, or above, the earth's surface.

Claim 2 (Cancelled).

Claim 3 (Original): The method of claim 1 wherein the step of continuously injecting the fluid into the subterranean formation maintains a positive pressure in the subterranean formation.

Claim 4 (Original): The method of claim 1 wherein the amplitude of the pressure pulse is sufficient to stimulate hydrocarbon recovery from the subterranean formation.

Claim 5 (Original): The method of claim 4 wherein the amplitude of the pressure pulse is in the range of from about 100 psi to about 3,000 psi.

Claim 6 (Original): The method of claim 5 wherein the amplitude of the pressure pulse is below the fracture pressure of the formation.

Claim 7 (Original): The method of claim 1 further comprising the step of generating a pressure pulse having an amplitude different from the amplitude of a previous pressure pulse.

Claim 8 (Original): The method of claim 1 wherein the frequency is in the range of about 0.001 Hz to about 1 Hz.

Claim 9 (Original): The method of claim 1 wherein the amplitude of the pressure pulse is sufficient to fracture the subterranean formation.

Claim 10 (Currently Amended): A system for applying a pressure pulse to a subterranean formation, comprising:

means for continually injecting a fluid into the subterranean formation; and

means for periodically applying a pressure pulse having a given amplitude and frequency to the fluid while the fluid is being injected into the subterranean formation; wherein the injection means and pressure pulsing means are located at about, or above, the earth's surface.

Claim 11 (Original): The system of claim 10 wherein the injection means comprises a positive head or positive displacement device.

Claim 12 (Original): The system of claim 11 wherein the positive head or positive displacement device comprises a pump.

Claim 13 (Original): The system of claim 10 wherein the pressure pulsing means comprises:

a housing;

a plunger disposed in the housing;

a power source for moving the plunger within the housing;

a fluid injection port through which the fluid is supplied into the housing; and

an outlet port through which the fluid exits the housing.

Claim 14 (Original): The system of claim 13 wherein the plunger has a hollow chamber in fluid communication with the fluid injection port through openings in the surface of the plunger, and the hollow chamber is in fluid communication with the outlet port through a plunger outlet.

Claim 15 (Original): The system of claim 14 wherein the pressure pulsing means further comprises a check valve in fluid communication with the hollow chamber.

Claim 16 (Original): The system of claim 14 wherein the power source is hydraulic or pneumatic.

Claim 17 (Original): The system of claim 14 wherein the pressure pulsing means applies a pressure pulse when the power source applies a downward force upon the plunger, causing the plunger to travel downward, and thereby compress the fluid in the housing.

Claim 18 (Original): The system of claim 17 wherein the amplitude of the pressure pulse generated may be varied by varying the downward force applied by the power source to the plunger.

Claim 19 (Original): The system of claim 17 wherein the amplitude of the pressure pulse may be controlled to within about 10 psi of a target pressure.

Claim 20 (Original): The system of claim 10 wherein the amplitude of the pressure pulse is sufficient to stimulate hydrocarbon recovery from the subterranean formation.

Claim 21 (Original): The system of claim 20 wherein the amplitude of the pressure pulse is in the range of from about 100 psi to about 3,000 psi.

Claim 22 (Original): The system of claim 10 wherein the frequency of the pressure pulse is a frequency sufficient to stimulate hydrocarbon recovery from the subterranean formation.

Claim 23 (Original): The system of claim 22 wherein the frequency is in the range of from about 0.01 Hz to about 1 Hz.

Claim 24 (Cancelled).

Claim 25 (Currently Amended): The system of claim 10-24 wherein the injection means and/or the pressure pulsing means is mounted to a wellhead of a wellbore which penetrates the subterranean formation.

Claim 26 (Currently Amended): The system of claim 10-24 wherein the injection means and/or the pressure pulsing means is remotely located to a wellbore penetrating the subterranean formation.

Claim 27 (Currently Amended): The system of claim 10-24 further comprising a network of conduits connecting the pressure pulsing means to a plurality of wellbores.

Claim 28 (Original): The system of claim 27 wherein the wellbores are separated from each other by a distance of up to about 640 acres.

Claim 29 (Original): A system for applying a pressure pulse to a subterranean formation comprising:

a pump for continuously injecting a fluid into the subterranean formation; and

a pressure pulse application device for applying a pressure pulse having a given amplitude and frequency to the fluid while the fluid is being injected into the subterranean formation, the pressure pulse application device comprising:

a housing comprising:

a fluid inlet port through which the fluid is supplied into the housing; and

a fluid outlet port through which the fluid exits the housing;

a fluid supply connected to the fluid inlet port;

a plunger disposed in the housing, wherein the plunger has a hollow chamber; and

a power source for moving the plunger.

Claim 30 (Original): The system of claim 29 wherein the pressure pulse application device generates a pressure pulse when the power source applies a downward force upon the plunger, causing the plunger to travel downward, and thereby compress the fluid in the housing.

Claim 31 (Original): The system of claim 29 further comprising a network of conduits connecting the fluid outlet port to a plurality of wellbores.

Claim 32 (Original): The system of claim 31 wherein the wellbores are separated from each other by a distance of up to about 640 acres.

Claim 33 (Original): The system of claim 29 further comprising a check valve in fluid communication with the hollow chamber.

Claim 34 (Original): The system of claim 29 wherein the power source is hydraulic or pneumatic.

Claim 35 (Original): The system of claim 29 wherein the amplitude of the pressure pulse generated may be varied by varying a downward force applied by the power source to the plunger.

Claim 36 (Original): The system of claim 35 wherein the amplitude of the pressure pulse may be controlled to within about 10 psi of a target pressure.

Claim 37 (Original): The system of claim 29 wherein the amplitude of the pressure pulse generated is sufficient to stimulate hydrocarbon recovery from the subterranean formation.

Claim 38 (Original): The system of claim 37 wherein the amplitude of the pressure pulse generated is in the range of from about 100 psi to about 3,000 psi.

Claim 39 (Original): The system of claim 29 wherein the pressure pulse is generated at a frequency sufficient to stimulate hydrocarbon recovery from the subterranean formation.

Claim 40 (Original): The system of claim 39 wherein the frequency is in the range of from about 0.01 Hz to about 1 Hz.

Claim 41 (Original): The system of claim 29 wherein the system is located at about, or above, the earth's surface.

Claim 42 (New): A system for applying a pressure pulse to a subterranean formation, comprising:

means for continually injecting a fluid into the subterranean formation; and

means for periodically applying a pressure pulse having a given amplitude and frequency to the fluid while the fluid is being injected into the subterranean formation, the pressure pulsing means comprising:

a housing;

a fluid injection port through which the fluid is supplied into the housing;

an outlet port through which the fluid exits the housing;

a plunger disposed in the housing, the plunger having a hollow chamber in fluid communication with the fluid injection port through openings in the surface of the plunger, the hollow chamber being in fluid communication with the outlet port through a plunger outlet; and

a power source for moving the plunger within the housing.

Claim 43 (New): The system of claim 42 wherein the pressure pulsing means further comprises a check valve in fluid communication with the hollow chamber.

Claim 44 (New): The system of claim 42 wherein the power source is hydraulic or pneumatic.

Claim 45 (New): The system of claim 42 wherein the pressure pulsing means applies a pressure pulse when the power source applies a downward force upon the plunger, causing the plunger to travel downward, and thereby compress the fluid in the housing.

Claim 46 (New): The system of claim 45 wherein the amplitude of the pressure pulse generated may be varied by varying the downward force applied by the power source to the plunger.

Claim 47 (New): The system of claim 45 wherein the amplitude of the pressure pulse may be controlled to within about 10 psi of a target pressure.

Claim 48 (New): A system for applying a pressure pulse to a subterranean formation, comprising:

means for continually injecting a fluid into the subterranean formation;

means for periodically applying a pressure pulse having a given amplitude and frequency to the fluid while the fluid is being injected into the subterranean formation, the pressure pulsing means comprising:

a housing;

a plunger disposed in the housing;

a power source for moving the plunger within the housing, the power source comprising an accumulator capable of storing fluid under pressure;

a fluid injection port through which the fluid is supplied into the housing; and

an outlet port through which the fluid exits the housing.

Claim 49 (New): The system of claim 48, wherein the accumulator comprises a gas-charged or spring-charged pressure vessel.